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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/138,429	08/24/1998	IMRAN HASHIM	AMAT/2406/MD	4066

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APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

MERCADO, JULIAN A

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 01/22/2003

23

Please find below and/or attached an Office communication concerning this application or proceeding.

AS23

Office Action Summary

Application No.

09/138,429

Applicant(s)

HASHIM ET AL.

Examiner

Julian Mercado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 21-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-40 is/are rejected.
- 7) ☒ Claim(s) 27 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 22. 6) ☐ Other: _____

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DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 27, 2002 has been entered.

Claims 21-40 remain pending.

Claim Objections

Claim 27 is objected to because of the following informalities: The claim appears to have been submitted in duplicate. See page 1 and page 2 of the November 27, 2002 response. As the claims are exactly identical with the second occurrence appearing to be a document editing oversight, it is suggested to delete the second instance of the claim.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 31 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 31 recites that the grounded collimator reduces interference with the parallel magnetic field. However, it is unclear from the scope of the claim between which structural or physical bodies the reduction of interference occurs, e.g. between any two of the plasma, the magnetic field, the sputter chamber wall, the collimator itself, the target or the substrate.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 21, 24 and 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kisakibaru et al. (U.S. Pat. 5,945,008) in view of Tepman (U.S. Pat. 5,527,438).

At the outset, the preamble recitation of an apparatus for depositing a magnetic film has not been given the effect of a limitation in the claim. The preamble appears to be only directed to the purpose or intended use of the apparatus, and the additional components of the claims can stand alone without depending on the preamble for completeness.

Regarding claim 21, Kisakibaru teaches a chamber having a substrate support with a concentrically-positioned annular magnet array [53] disposed within the chamber to form a magnetic field parallel to the surface of the substrate [50]. (Figure 9B, col. 3 line 56-60, col. 10 line 8-16, also applies to claim 24, 32, 34) The magnet array is in plurality of permanent magnet type. (applies to claim 33) The configuration in Kisakibaru is considered to be a Halbach array

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in providing a parallel magnetic field, notably consistent with applicant's disclosure.

(specification page 4, line 29 et seq., applies to claim 35)

Kisakibaru does not explicitly teach a sputtering chamber. However, Kisakibaru teaches that the invention may be employed for when plasma is used for sputtering. (col. 2 line 53-57) Thus, at the time the invention was made, the skilled artisan would have found obvious to use Kisakibaru's invention as part of a sputtering apparatus, for reasons such as controlling the quality of processing of the deposited film thickness.

Kisakibaru does not explicitly teach the sputtering chamber to have a target and a grounded collimator. However, Tepman is relied upon to teach these components of a sputtering chamber such as found in grounded collimator [12] and target [14]. (Figure 1) The examiner notes applicant's disclosure of the instant grounded collimator to be similarly as described in Tepman. (See specification p. 6 lines 3-5) Thus, the skilled artisan would find obvious to employ in Kisakibaru's invention a grounded collimator, for reasons such as screening highly oblique sputtered particles, thereby providing a symmetrical flux of target particles. The skilled artisan would further find obvious that the sputtering chamber in Tepman, more so *any* sputtering chamber, employs a target, as the target is the requisite component of the apparatus that is sputtered by the plasma bombardment.

Claims 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kisakibaru et al. in view of Tepman as applied to claims 21, 24 and 32-35 above, and further in view of Hsu (U.S. Pat. 5,589,039).

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The examiner notes that while claim 22 recites depositing of a material that retains magnetic properties, the preamble recitation of depositing a magnetic thin film is still not given the effect of a limitation in the claim as there is no claimed correlation between the deposited material and the magnetic film recited in the preamble.

The teachings of Kisakibaru and Tepman are discussed above.

Regarding claim 22, while Kisakibaru does not explicitly teach a target comprising a magnetic material which retains its magnetic properties upon deposition, Hsu specifically teaches that the domains of a magnetic sputtered target [21] are aligned during deposition with application of a substantially parallel magnetic field. (col. 1 lines 43-52 and col. 5 lines 49-53) Thus, it would have been obvious to one of ordinary skill in the art that a target of magnetic material would retain its magnetic properties upon deposition due to the effects of the substantially parallel magnetic field thereon.

Claims 23, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kisakibaru et al., Tepman and Hsu as discussed for claim 22 above, and further in view of Boys et al. (U.S. Pat. 4,500,409).

While Kisakibaru does not explicitly teach a long throw distance of at least 50 mm (claims 23 and 26), Boys teaches a long throw distance equal to 2.5 in or 63 mm. (Col. 12 line 37) Thus, it would have been obvious to one of ordinary skill in the art to further modify Kisakibaru's invention by employing a long throw distance of at least 50 mm, for reasons such as enhancing the deposition rate and uniformity.

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While Kisakibaru does not explicitly teach a Ni/Fe alloy for the target (claim 25), Boys teaches a Ni/Fe alloy, which is known in the art as Permalloy. (Col. 12 line 23) Thus, it would have also been obvious to use Ni/Fe as the target material as this material is well-known and its use would have been motivated for reasons such as commercial availability and well-known performance for a magnetic film material.

Claims 27-31 and 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alex (U.S. Pat. 5,616,218) in view of Tepman, Boys et al. and Kisakibaru et al.

Regarding claim 27, Alex teaches a collimator [46] positioned between a target [43] and a substrate [49] for the sputtering of a magnetic film for forming magnetic recording media, e.g. magnetic recording heads. (also applies to claim 40) The collimator is inherently grounded as the collimator is supported and therefore in mutual electrical contact with the grounded chamber wall. Notwithstanding, in view of Tepman as discussed in a previous Office Action it would have been obvious to one of ordinary skill in the art to employ a grounded collimator for reasons such as maintaining a negative voltage on the target relative thereto.

While Alex does not explicitly teach sputtering at a pressure of less than about 15 mTorr or 5 mTorr (claims 27 and 28, respectively) or a T/S distance of at least 50 mm (claim 29), Boys is relied upon to teach a pressure of less than about 5 mTorr or a T/S distance of at least about 50 mm. Thus, the skilled artisan would have found obvious to employ a pressure of less than 5 mTorr or 15 mTorr and employ a T/S distance of at least 50 mm, for reasons such as enhancing the sputtering efficiency and uniformity of the deposition process.

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Alex does not explicitly teach a Ni/Fe target which is magnetic. (claim 30, 36) However, Boys teaches a Ni/Fe target such as found in a Permalloy target. Thus, the skilled artisan would have found obvious to employ a Ni/Fe target for reasons such as employing a target which is commercially available and having a well-known performance as a magnetic film material.

As to claim 31, to the extent that the claim is understood by the examiner for the reasons discussed under 35 U.S.C. 112, second paragraph (discussion above), the collimator in Alex is specifically disclosed to intercept target particles. (col. 6 line 42-65) The incident target particles would resultantly be reduced within the parallel magnetic field and its induced electric field component. Since the collimator is grounded, i.e. not electrically floating, the target charges would be removed upon impingement.

Regarding claims 37-39 and as to generating a substantially parallel magnetic field using a concentrically positioned magnet array in which a permanent magnet array is positioned around an outer perimeter of the substrate surface, Kusakibaru et al. as discussed above is relied upon to teach this configuration. Thus, at the time the invention was made, it would have been obvious to one of ordinary skill in the art to further modify Alex's invention by providing a substantially parallel magnetic field at the surface of the substrate during sputtering. The motivation for such a modification would be to control the magnetic flux density of the plasma, thereby enhancing the quality of processing of the deposited film thickness.

Allowable Subject Matter

Claim 31 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112, second paragraph, set forth in this Office Action and to include all of the limitations of base

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claim 27, and if rewritten to more clearly recite that the reduction of interference by the collimator as a reduction of between a plasma body and the parallel magnetic field. (see specification page 6, line 3-12)

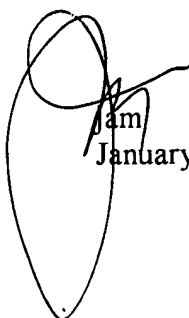
Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Pat. 5,807,467 to Givens et al. teaches a collimator which is electrically biased either positive or negative. U.S. Pat. 3,669,860 to Knowles et al. teaches a collimator [50] which is biased negative.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian Mercado whose telephone number is (703) 305-0511. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jam
January 15, 2003


Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700